

**WORK PLAN
FOR
MONITORING WELL INSTALLATION AND GROUNDWATER MONITORING
VULCAN LOUISVILLE SMELTING SITE
NORTH CHICAGO, LAKE COUNTY, ILLINOIS**

**Technical Direction Document No. S05-0608-002
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**APPROVAL OF WORK PLAN
FOR GROUNDWATER WELL INSTALLATION AND MONITORING
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**VULCAN LOUISVILLE SMELTING SITE
NORTH CHICAGO, ILLINOIS**

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LIST OF ACRONYMS AND ABBREVIATIONS

bgs	below ground surface
EE/CA	Engineering Evaluation/ Cost Analysis
FM	Field Manager
HASP	Health and Safety Plan
PM	Project Manager
PVC	Poly Vinyl Chloride
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
SOP	Standard Operating Procedure
SOW	Statement of Work
SSHO	Site Health and Safety Officer
START	Superfund Technical Assessment and Response Team
STN JV	Sullivan International/T.N. Associates, Inc. Joint Venture Team
TCE	Trichloroethylene
TDD	Technical Direction Document
TN&A	T N & Associates, Inc.
UFP	Uniform Federal Policy
U.S. EPA	U.S. Environmental Protection Agency - Region 5
VOCs	Volatile Organic Compounds

1.0 INTRODUCTION

Sullivan International, Inc. and TN&A Joint Venture Team's (STN) Superfund Technical Assessment and Response Team (START), has been tasked by the remedial division of the U.S. Environmental Protection Agency Region 5 (U.S. EPA) to collect surface water samples from Pettibone Creek, install groundwater monitoring wells, perform groundwater monitoring of the new and existing monitoring wells and evaluate the reductions of contaminants in the groundwater plume at the Vulcan Louisville Smelting site, North Chicago, Illinois. This work is being performed under Technical Direction Document (TDD) number S05-0608-002 and START Contract number EP-S5-06-03.

This work plan provides guidance for the groundwater well installation, sampling and analysis activities associated with the surface water sampling and groundwater monitoring at the Vulcan Louisville Smelting site (site), Lake County, Illinois.

2.0 SITE DESCRIPTION AND BACKGROUND

The site is located at 1 Tantalum Place, North Chicago, Lake County, Illinois and comprises of two parcels; the former Fansteel parcel and the Vacant Lot parcel to the west of the Fansteel facility. The Vacant Lot is bisected by Pettibone Creek (Creek), an intermittent creek. A map of the project area showing the monitoring well sampling locations is presented in Figure 1. The Fansteel Engineering Evaluation/ Cost Analysis (EE/CA) investigation identified elevated levels of cadmium, lead, trichloroethylene (TCE) and vinyl chloride in soils and elevated levels of lead, TCE, vinyl chloride, cadmium and other volatile organic compounds (VOCs) in groundwater on the Fansteel property.

The City of North Chicago has acquired the Fansteel parcel and a portion of the Vacant Lot parcel east of Pettibone Creek in order to foster redevelopment of the site. The US EPA conducted a removal action in November/December 2008 to mitigate the release of hazardous substances and to abate threats to human health and the environment at the Vulcan Louisville Smelting Site.

3.0 SITE GEOLOGY AND HYDROLOGY

3.1 Site Geology

Regional geologic information indicates that unconsolidated materials in the vicinity of the site consist of glacial lake deposits underlain by glacial till deposits. The deposits consist of clay, silt, sand and gravel. Unconsolidated materials encountered during previous investigations were similar at all locations across the site. Fill material that ranges in thickness from 0.5 foot to 7.0 feet is present underneath the surficial asphalt and/or concrete and vegetation. Underlying the fill material are typical glacial lacustrine deposits comprised of finer grained materials including brown and gray silty and sandy clay, clayey silt containing laterally discontinuous silt lenses, and sand/gravel deposits to depths ranging from approximately 10.0 feet to 13.0 feet bgs. Grayish silty clay with several laterally discontinuous silt, sand, and gravel layers is present from a depth of approximately 10 to 20 feet.

3.2 Site Hydrology

The shallow aquifer exists within the near surface glacial lacustrine deposits and, to a lesser extent, within the surficial fill materials. During previous investigations, groundwater was encountered beneath the Fansteel parcel and the Vacant Lot parcel at depths ranging from 3.0 feet and 13.6 feet bgs. Groundwater within the shallow aquifer generally flows in a westerly direction toward Pettibone Creek.

4.0 PROJECT MANAGEMENT AND OPERATIONS

4.1 Project Staff

Program management, administration, and quality assurance oversight will be conducted out of STN's office located in Chicago, Illinois. The Field Manager (FM) will provide onsite oversight and will assist the field team with technical, operational, or other project-related issues.

The FM will direct groundwater sampling activities, and will oversee compliance with established health and safety requirements, and serve as site safety and health officer (SSHO) in the absence of the project health and safety officer. The FM will conduct daily safety meetings.

During each work shift, one STN field team member will maintain field notes detailing general sampling activities, and compile sampling forms.

4.2 Health and Safety

All field staff will be trained to the Site-Specific Health and Safety Plan (HASP), Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP) guidelines, applicable STN Standard Operating Procedures (SOPs) and work instructions, and applicable quality procedures as appropriate to their assigned roles. The FM will be responsible for monitoring adherence to the project plans and HASP requirements.

4.3 Schedule

Groundwater monitoring well installation and sampling is scheduled to occur during the weeks of December 07th and September 14th, 2009 during daylight hours, typically 10-hour days. Longer operational days may be necessary due to delays in project schedule and weather constraints.

5.0 SITE PREPARATION

Prior to sampling activities, site preparation activities will be performed, and will include:

- Amend the HASP, which has been prepared in accordance with Code of Federal Regulations (CFR) Part 1910.120;
- Schedule personnel and vehicles;
- Arrange access to property with the Client;
- Secure field equipment and check it for proper operation;
- Notify the City of North Chicago official before sampling; and
- Get utility clearance;
- Field operations will be documented on the field logbook by the STN Personnel.

6.0 MONITORING WELL INSTALLATION AND DEVELOPMENT

6.1 Groundwater Well installation

A monitoring network comprising of – new wells will be installed on the site using direct push technologies (DPT) equipment. These wells will be installed strategically to monitor downgradient and upgradient groundwater conditions at the site.

- Groundwater wells will be installed to sample the shallow aquifer that exists at the site. Historical boring logs show that groundwater was encountered beneath the Fansteel property and Vacant Lot property at depths ranging from 3 feet and 14 feet below ground surface.
- Continuous soil sampling with a split-spoon will be conducted during well installation.
- Wells will be installed with 2-inch Inner Diameter PVC risers and 10-feet long screens with standard 0.010 inch factory cut slots, standard sand filter pack with bentonite annular space seal. Borehole size of the well will be 3.5 inches and bentonite pellets will be used for annular seal and grout. Protective casings will be put in concrete.
- For the wells located in Fansteel area, flushmount surface casings will be constructed with 2 foot by 2 foot concrete surface pads and bumper posts adjacent to those wells in order to protect them from vehicular traffic
- For the wells located in Vacant Lot area, Steel standpipes will be completed.
- All the wells will be locked.

6.2 Decontamination

- A decontamination pad will be constructed prior to drilling and remove at end of drilling.
- Split spoons will be decontaminated with an Alconox/potable water solution and rinsed in potable water between samples.
- Augers and rods will be decontaminated with steam cleaner between boring locations.

- All soil cuttings and decontamination/purged water will be stored in drums and staged at the site for disposal.
- Each boring/well location will be restored to original condition to the extent possible.

6.3 Well Development

- Wells will be developed as soon as it is practical after installation, but not sooner than 48 hours after grouting is completed.
- Wells will be developed using Fultz or bladder pumps. A surge block will be used to create a surging action for short periods of time to help break up or loosen the sediment that entered the well. A pump will be used to remove the silty water that results from surging. The surge block will be composed of inert material that will not affect the water quality in the well. The diameter of the surge block will be 0.125 to 0.25 inches smaller than the inside diameter of the well.
- Field parameters will be collected after every well volume is removed.

Well development will be continued until the following criteria have been met:

- Three times the volume of water lost to formation during drilling has been purged from the well;
- Field parameters have stabilized for three consecutive measurements. Typical field parameter stabilization criteria is included in Table 7-1
- If stabilization of parameters has not been met, well development will be continued up to a maximum duration of four hours,
- The yield of the well is representative of the transmissivity of the aquifer.

7.0 MONITORING WELL SAMPLING

The overall objective of this plan is to monitor post-removal water quality and ascertain natural dissipation of groundwater plume.

7.1 Water Level Gauging

Water level gauging will be performed at wells prior to field water quality measurement or sampling activities. Water level measurements should be taken to establish site specific groundwater gradients. These measurements would be used to determine the relationship between the monitoring well and a plume (side, cross-gradient, or other), the position of new wells to fill data gaps and seasonal variations. Guidelines for the frequency of taking water level measurements are as follows:

- a) Initially, water levels will be measured quarterly in all monitoring wells at the site for a minimum of two years. This will establish an indication of seasonal variations and a baseline to evaluate future groundwater gradients.
- b) Water levels will be measured prior to purging any well.
- c) All water levels should be obtained within as short a time period of each other as practicable.
- d) The frequency of water level measurements would be considered for reduction if variation of flow direction and rate has been quantified.

7.2 Groundwater Sampling

Samples will be collected from the source, downgradient, upgradient and cross gradient wells. Monitoring well samples will be collected from existing and new wells.

7.2.1 Sampling Frequency

- a) All new wells will be included with the existing wells into a monitoring system and sampled quarterly for two years. USEPA will review the data to determine future sampling frequencies.

- b) If a well is determined unnecessary and it is anticipated that the well will not be used during any time during the monitoring program, that well will be proposed for abandonment according to relevant regulations.

7.2.2 Inspection and Well Maintenance

- a) The condition of wells will be inspected at each sampling event or at least once an year.
- b) Specific well conditions to check:
 - i) Surface seal
 - ii) Well locks
 - iii) Casing integrity
 - iv) Total depth of well
 - v) Any other relevant conditions
- c) Any necessary repairs will be made prior to the next quarterly sampling event.
- d) If a well can not be properly repaired, it will be replaced or abandoned.

7.2.3 Purging and Sampling with Pumps

Low-flow pumping rates in the approximate range of 0.1 to 0.3 liters per minute (L/min) will be used. Purged groundwater will be directed through a flow-through-cell equipped with a multi-parameter probe. Purging will be continued until water quality parameters have stabilized as described below. Typically pH, temperature, specific conductance, oxygen reduction potential (ORP), dissolved oxygen (DO), and turbidity will be recorded at 5 minute intervals during purging. Parameters will be considered “stabilized” when three consecutive readings within the criteria listed in Table 7-1 are recorded.

After field parameters have stabilized, samples will be collected into the appropriate containers. All metal samples will be filtered before collection. VOCs samples will be collected first and metals will be sampled after VOCs samples are collected.

Table 7-1 Groundwater Parameter Stabilization Criteria Monitoring Well Installation and Groundwater Monitoring Vulcan Louisville Smelting Site	
Measurement	Criteria
pH	± 0.1 pH unit
Temperature	± 10 percent
Specific conductance	± 3 percent
ORP	± 10 millivolts (mV)
Dissolved oxygen	± 10 percent
Turbidity	Target of 10 NTUs or less for metals samples, 50 NTUs or less for organics samples

If the drawdown during low-flow purging is greater than 0.33 feet, then the micropurge technique is assumed to be invalid and will be discontinued. When drawdown is greater than 0.33 feet, groundwater flow to the pump is no longer considered to be laminar across the screen from the aquifer. In this situation (.i.e., drawdown > 0.33 feet at low-flow rates), purging and sampling technique using a Fultz or bladder pump would be followed. Water quality parameters such as pH, temperature, etc. will be measured using flow through cell.

7.2.4 Sample Collection Order when using a pump

1. VOCs
2. Metals
3. alkalinity, chloride, nitrite, nitrate, dissolved methane, iron (II) and iron (III), chloride, sulfate, sulfide, total organic carbon

7.2.5 Sample Analysis

Five existing wells (MW-2, MW-4, MW-6, MW-8 and MW-9) and seven new wells (VLS-MW-1 through VLS-MW-7) will be sampled as part of this monitoring program. In addition to this, three surface water samples will be collected from Pettibone creek. Surface water samples will be collected from one Upgradient location, one downgradient location and one location near Vacant Lot source area. Since Pettibone creek is an intermittent creek which is mainly fed by the storm water and surface run-off, surface water sampling will be scheduled around a storm event. All Samples will be collected for VOCs, metals and other parameters and analyzed using SW-846 methods. The proposed number of samples and analytical methods are included in Table 7.2.

All samples will be sent to a commercial laboratory for analysis requiring a removal turnaround time for reporting the results.

7.2.6 Disposal of Soil Cuttings and Purged Water

All soil cuttings and purged water will be containerized in separate drums and stored at the site for disposal. One sample each for soil cuttings and purged water will be collected and analyzed for VOCs and metals. Based on the analytical results, soil and water will be disposed as required.

Table 7-2 Sample Requirements Monitoring Well Installation and Groundwater Monitoring Vulcan Louisville Smelting Site						
Matrix	Parameter	Method	Volume and Containers	No. of Samples (Including QC samples)*	Preservation Techniques	Holding Time (Extraction/ Analysis)
Water	Volatile organic compounds (VOC)	SW-846: 8260B	Three 40-mL glass vials with Teflon [®] -lined septum	20	To pH # 2 with hydrochloric acid; sodium thiosulfate if residual chlorine; store at 4°C	None/14 days
Water	Metals (except mercury)	SW-846: 6010B	One 1,000-mL glass or polyethylene bottle	19	To pH < 2 with nitric acid (HNO ₃); store at 4°C	None/180 days
Water	alkalinity, chloride, nitrite, nitrate, dissolved methane, iron (II) and iron (III), chloride, sulfate, sulfide, total organic carbon		One 1,000-mL glass or polyethylene bottle	19	To pH < 2 with nitric acid (HNO ₃); store at 4°C	None/180 days

* Samples will include 3 surface water samples, 12 well samples, 2 duplicates, one trip blank for VOCs, one matrix spike and one matrix spike duplicate sample (also MS/MSD).

8.0 REPORTING

START will submit a report after well installation to include details on well drilling, installation and development. START will submit summary tables of the data with water levels and water quality for each quarterly sampling event. One report will be generated at the end of the each year to summarize all the sample results from the first four quarterly sampling events and to ascertain natural dissipation of groundwater plume. This report will discuss in detail, if there is any change in the contaminant levels in the wells sampled or any movement of the contaminant plume. This report will be generated and submitted to EPA within 30 days after receipt of the analytical results from the fourth quarterly sampling event.

Table 8-1 Deliverables and Schedule Monitoring Well Installation and Groundwater Monitoring Vulcan Louisville Smelting Site	
Deliverable/Event	Schedule
Surface water Sampling	To be declared
Monitoring Well Installation	Week of Dec 07 th , 2009
1 st Round of Sampling	Week of Dec 07 th , 2009
Receipt of Analytical results	December 15th
Submittal of report on well installation and analytical data	To be declared